

### Analysis of European Modular Cultivation System (EMCS) Operations

In an effort to correlate EMCS operations with SAMS vibratory measurements, several analyses were performed. These were based on SAMS acceleration data measured in the Columbus module during EMCS operation times. The first analysis was a cursory pass to examine SAMS daily roadmap spectrograms to check for distinct transitions. Next, rotor frequency information gleaned from an EMCS web page was leveraged along with a tailored routine to seek correlation between expected EMCS ops and possible spectral signatures in SAMS measurements. Last, ancillary telemetry data possibly related to EMCS operations was queried and compared to 5-minute interval RMS data computed from SAMS measurements.

First, the results from a preliminary analysis of SAMS acceleration data for the last week of April 2014 through the first 3 days of May 2014 showed several distinct transitions like that seen in the black rectangle on the first page of this document. However, nothing conclusively could be identified specific to or associated with EMCS equipment.

Next, an email received from the Operations Controller gave recent GMT time spans when EMCS payload equipment was known to start/stop and when their science runs started/stopped. Results from an analysis that followed from that email led to frequency information with potential for detection of EMCS rotor signature. It was thought that if energetic enough, that might show up as a narrow-band peak in the low-frequency range from about 0.03 Hz to about 1.4 Hz. In order to best focus on this range, a tailored spectral analysis routine was implemented to hone in. The results obtained perhaps match some part of the frequency information, but do not match what was given for expected GMT time spans.

Last, ancillary data for EXPRESS Rack 3 (ER3) and for EMCS were queried from the telemetry database. This query was submitted in the form of a NRT List Request in the Enhanced HOSC System (EHS). The results of that request provided specific GMT transition times with 10-minute resolution. This gave times to cross-check with changes in SAMS acceleration data, not just for the expected rotor frequency range, but across the entire SAMS sensor measurement spectrum. Ultimately, this led to a comprehensive analysis run to gather 5-minute interval RMS SAMS data from GMT 05-May-2014/00:00 to GMT 08-May-2014/00:00, which included the transition times from the NRT List Request for potential correlation. Those results did not show definitive correlation between transition times that were thought perhaps due to EMCS operations.

The plots and narrative on the next few pages reflect some of the details discussed above.

